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jc560 U.S. PTO 06/12/98

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	02964.P004
First Named Inventor:	Anand Narasimhan
Title	SCALABLE ARCHITECTURE FOR TRANSMISSION OF MESSAGES OVER A [illegible]
Express Mail Label No.	EM020278592US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. [X] Fee Transmittal Form
(Submit an original, and a duplicate for fee processing)

2. [X] Specification [Total Pages 19]
(preferred arrangement set forth below)
- Descriptive title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to Microfiche Appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings (*if filed*)
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

3. [X] Drawing(s) (35 CFR 113) [Total Sheets 5]

4. Oath or Declaration [Total Pages 3]
a. [X] Newly executed (original copy)
b. [ ] Copy from a prior application (37 CFR 1.63(d))
(for continuation/divisional with Box 17 completed)
[Note Box 5 below]
i. [ ] DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).

5. [ ] Incorporation By Reference (usable if Box 4b is checked)
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

6. [ ] Microfiche Computer Program (*Appendix*)

7. Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
a. [ ] Computer Readable Copy
b. [ ] Paper Copy (identical to computer copy)
c. [ ] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. [X] Assignment Papers (cover sheet & document(s))
9. [ ] 37 CFR 3.73(b) Statement (when there is an assignee) [ ] Power of Attorney
10. [ ] English Translation Document (if applicable)
11. [ ] Information Disclosure Statement (IDS)/PTO - 1449 [ ] Copies of IDS Citations
12. [ ] Preliminary Amendment
13. [X] Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
14. [ ] *Small Entity Statement(s) [ ] Statement filed in prior application, Status still proper and desired
15. [ ] Certified Copy of Priority Document(s)
(if foreign priority is claimed)
16. [X] Other: -Appendix I (22 pages)

17. If a **CONTINUING APPLICATION**, check appropriate box and supply the requisite information:
[ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No: ____/____
Prior application Information: Examiner ____ Group/Art Unit: ____

18. CORRESPONDENCE ADDRESS

[ ] Customer Number or Bar Code Label (Insert Customer No. or Attach bare code label here) or [X] Correspondence address below

Name	BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP				
Address	12400 Wilshire Boulevard, Seventh Floor				
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Country	U.S.A.	Telephone	(310) 207-3800	Fax	(310) 820-5988

Name (Print/Type)	Eric S. Hyman, Reg. No. 30,139		
Signature	[signature]	Date	6/12/98

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FEE TRANSMITTAL

Petent fees are subject to annual revision on October 1.
These are the fees effective October 1, 1997.
Small Entity payments must be supported be a small entity statement, otherwise large entity fees must be paid. See Forms PTO/SB/09-12.
See 37 C.F.R §§ 1.28 and 1.28

TOTAL AMOUNT OF PAYMENT ($) 830.00

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	Anand Narasimhan, et al.
Examiner Name	
Group Art Unit	
Attorney Docket Number	02964.P004

METHOD OF PAYMENT (check one)

1. ☒ The Commissioner is hereby authorized to charge indicated fees and credit any over payments to.

Deposit Account Number: 02-2666

Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

☒ Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17 ☐ Charge the Issue Fee Set in 37 CFR 1.18 at the Mailing of the Notice of Allowance

2. ☒ Payment Enclosed:
☒ Check ☐ Money Order ☐ Other

FEE CALCULATION (fees effective 10/01/96)

1. FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
101	790	201	395	Utility filing fee	$790
106	330	206	165	Design filing fee	
107	540	207	270	Plant filing fee	
108	790	208	395	Reissue filing fee	
114	150	214	75	Provisional filing fee	
				SUBTOTAL (1)	($) 790.00

2. EXTRA CLAIM FEES

	Extra Claims		Fee from below		Fee Paid
Total Claims	1	-20** = 0	X $22.00	=	0.00
Independent Claims	1	-3** = 0	X $82.00	=	0.00
Multiple Dependent				=	

***or number of previously paid, if greater; For Reissues, see below*

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
103	22	203	11	Claims in excess of 20
102	82	202	41	Independent claims in excess of 3
104	270	204	135	Multiple Dependent claim
109	82	209	41	**Reissue independent claims over original patent
110	22	210	11	**Reissue claims in excess of 20 and over original patent
				SUBTOTAL (2) ($) 0.00

FEE CALCULATION (continued)

3. ADDITIONAL FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for response within first month	
116	400	216	200	Extension for response within second month	
117	950	217	475	Extension for response within third month	
118	1,510	218	755	Extension for response within fourth month	
☐ 128	2,060	228	1,030	Extension for response within fifth month	
119	310	219	155	Notice of Appeal	
120	310	220	155	Filing a brief in support of an appeal	
121	270	221	135	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidably	
141	1,320	241	660	Petition to revive - unintentionally	
142	1,320	242	660	Utility issue fee (or reissue)	
143	450	243	225	Design issue fee	
144	670	244	335	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Petitions related to provisional applications	
126	240	126	240	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	40
146	790	246	395	Filing a submission after final rejection (37 CFR 1.129(a))	
149	790	249	395	For each additional invention to be examined (37 CFR 1.129(b))	
Other fee (specify)					
Other fee (specify)					

* Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 40.00

SUBMITTED BY				Complete (if applicable)	
Typed or Printed Name	Eric S. Hyman, Reg. No. 30,139			Reg. Number	
Signature		Date	6/12/98	Deposit Account User ID	02-2666

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Our Ref. No.: 002964.P004
Express Mail No.: EM020278592US

UNITED STATES LETTERS PATENT APPLICATION

FOR

SCALABLE ARCHITECTURE FOR TRANSMISSION OF MESSAGES OVER A NETWORK

Inventors: Anand Narasimhan
Yaacov Shemesh
Amit Kumar

Prepared by:

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Los Angeles, California 90025

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to the field of message receipt/transmission and delivery using computer, phone, wireless and other communications networks. Specifically, the present invention relates to the transmission of e-mail messages which may be text only, text plus an audio file, text plus a video file, text plus a fax file or any combination thereof to a phone, pager or fax machine or other receiving device suitable for the message content, over appropriate communications networks using an architecture which enables easy expansion to handle additional message traffic as well as to connect to additional communications networks, including networks which do not presently exist which may become available in the future.

Description of Related Art

Voice and data communications systems such as the public switched telephone network (PSTN) are currently used to transfer image and text data transmitted by facsimile ("fax") machines in addition to the normally carried voice traffic. These faxed images are usually transmitted through the PSTN and received for printout or storage of the image on a destination fax machine or computer for the use by the recipient.

In U.S. Application Serial No. 08/829,857 filed April 1, 1997 entitled Method and Apparatus for Transmission and Retrieval of Facsimile and Audio Messages Over a Circuit or Packet Switched

Network, it is disclosed that to provide for the receipt and transmission of audio and fax information by a first user over a circuit switched network such as the public switched telephone network (PSTN) to a second user over a packet switched network such as the Internet, a communications server is connected both to the circuit switched network and a packet switched network.

The communications server contains resources to receive and process incoming audio and facsimile calls from the circuit switched network into a format suitable for transmission over the packet switched network to the second user's address. In addition, a link is first determined between the second user's address on the circuit switched network and the second user's address on the packet switched network, and then an appropriate route to the second user's address on the packet network is determined. With the system being maintained in a distributed and redundant fashion, reliable receipt and transfer of all messages is ensured. A copy of the specification and drawings of U.S. Application Serial No. 08/829,857 is attached hereto as Appendix I.

However, the architecture utilized as described in U.S. Application Serial No. 08/829,857 is not easily scalable to handle increasingly higher levels of message traffic or to easily connect to networks in addition to the PSTN and the Internet. Figure 1 shows the essence of the architecture of U.S. Application Serial No. 08/829,857. An e-mail message is passed to an outbound resource 11 (communications server 150 in U.S. Application Serial

No. 08/829,857) which converts the e-mail message to a fax format or to audio for transmission to a fax machine or telephone connected to the PSTN. A database 13 stores customer information necessary for processing of messages (an unnumbered part of communications server 150 in U.S. Application Serial No. 08/829,857 which is also contained in database server 195 in U.S. Application Serial No. 08/829,857). After processing of an e-mail message by outbound resource 11, a fax or voice mail message is sent over the PSTN or more generally, a generalized switched telephone network (GSTN) which includes cellular telephone networks as well as the PSTN. Optionally, a pager message may also be sent informing a user of the fax which has been sent or availability of a voice mail message as described in U.S. Patent Application Serial No. 08/902,400 filed July 29, 1997 entitled Processing and Forwarding Messages From a Computer Network to a Forwarding Service.

SUMMARY OF THE INVENTION

A method and apparatus for accepting an incoming message over a packet network and transmitting it over a circuit switched network using a highly scalable architecture. The architecture utilizes a message queue and a router/filter within a private data network which is connected to an external data network such as the Internet, with separate outbound resource servers to provide the high degree of scalability, for handling a variety of message types.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram of a prior art architecture which performs the functions, but not the scalability of the architecture of the present invention.

Figure 2 is a block diagram illustrating the architecture of the present invention.

Figure 3 is a block diagram showing the data/control flow through message queue 21, router/filter 23 and database 27.

Figure 4 (4a and 4b) is a flow diagram of the processing performed by router/filter 23.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a method and apparatus for allowing the receipt and transmission of audio, video and fax information between a circuit switched network and a packet switched network. For purposes of explanation, specific embodiments are set forth to provide a thorough understanding of the present invention. However, it will be understood by one skilled in the art, that the invention may be practiced without these details. Further, although the present invention is described through the use of circuit switched and packet switched networks, most, if not all, aspects of the invention apply to all networks in general. Moreover, well-known elements, devices, process steps and the like are not set forth in detail in order to avoid obscuring the present invention.

Referring now to Figure 2, e-mail messages for a customer are sent to/through an external data network 15 (e.g., the Internet) and routed to an appropriate SMTP/HTTP (or SHTTP) server 17 as determined by a domain name server (DNS) 18 according to well known techniques. The e-mail message may be a text message or it may include a file, the content of which may be audio, video or bitmapped (e.g., a fax) or other data. Again, the techniques for creating and sending e-mail messages with these characteristics are well known.

A processing server 19, which includes a message queue 21 and a router/filter 23 first verifies that the message is from or is to a customer using information in database 27. After successful

verification, the message is broken into fragments (in the case of files with multiple attachments) and written to message queue 21. Router/filter 23 obtains messages from the message queue and handles least call routing/billing/ prioritization/filtering of messages. Filtering is primarily for notification messages for pager delivery. After billing verification and determination of a least cost route, the message is assigned to one or more outbound resources 31 for delivery to the intended recipient by a method or methods selected by the customer as previously recorded in database 27.

In the case of faxes, the outbound resource is a server which dials the destination fax number and sends the fax.

In the case of voice messages, the outbound resource is a server which dials the destination telephone number and plays the voice message.

In the case of notification messages, the outbound resource is a server which dials out to the paging terminal or delivers the notification message through any appropriate paging gateway.

After the message (in whatever form) has been delivered, a receipt with details and an error log (if any) is sent back via a secure protocol to the message queue 21.

The receipt/error log messages are then processed by the router/filter which interfaces with a billing system (not shown) for customer account update.

Figure 3 is a block diagram showing the data/control flow through message queue 21, router/filter 23 and database 27 using information contained in the following tables as explained with reference to Figures 4a and 4b.

MESSAGE_ID	This is a unique number assigned to each message that arrives in the system.
RESOURCE_ID	Unique number assigned to each Outbound Resource
RESOURCE_TYPE	Each Resource is identified by the type of messages it can deliver (e.g., FAX, VOICE, NOTIFY, etc.)
RESOURCE_ADDRESS	Location of the Resource (such as IP address)
MESSAGE_TO_EMAIL_ADDRESS	To: address of the message
MESSAGE_FROM_EMAIL_ADDRESS	From: address of the message
MESSAGE_LOCATION	Location of actual message on the Message Queue 21
MESSAGE_SIZE	Size of the message in bytes
MESSAGE_PRIORITY	Priority of the message (e.g., low, medium, high)
MESSAGE_CREATION_DATE	Timestamp identifying the date/time that the message was received by the system
MESSAGE_EXPIRY_DURATION	Amount of time after which the message becomes stale
MESSAGE_SCHEDULED_DATE	Scheduled delivery timestamp for the message
MESSAGE_STATUS	Current status of the message (Active, Pending, Sent, etc.)
MESSAGE_ESTIMATED_COST	Estimated cost for the delivery of the message
CUSTOMER_KEY	Unique number identifying the customer in the database
MESSAGE_PART_OF_BROADCAST	Flag identifying if the message is part of a larger broadcast list waiting to be delivered
BROADCAST_ID	Unique number identifying a broadcast list
COVERPAGE_ID	Unique number identifying a coverpage (if any) for a fax
MESSAGE_SUBJECT	Subject line of the message to be delivered
MESSAGE_DURATION	Duration of the message (delivery time of fax, or delivery time for a voice message, etc.)
MESSAGE_RATE	Rate for message delivery (dollars per second, etc.)
MESSAGE_SEND_DATE	Actual timestamp identifying when the message was delivered
MESSAGE_REMOTE_CSID	Identifier of the fax machine to which a FAX message was delivered
MESSAGE_TYPE	Type of message (e.g., FAX, VOICE, NOTIFICATION, etc.)
RESOURCE_COMMUNICATION_TYPE	Protocol used to communicate with the resource (HTTP, SHTTP, etc.)
MESSAGE_LANGUAGE_CODE	Language used for delivery of a receipt or response, based on settings in the customer table
MESSAGE_PAGES	Number of pages of a message (used primarily for a fax)

Table 1 Message Queue Table

FILETYPE_MESSAGE_TYPE	Identifier of a message type (FAX, VOICE, etc.)
FILETYPE_RESOURCE_TYPE	Identifier to determine a resource that can handle a particular file type
FILETYPE_EXTENSION	The filename extension that identifies a file type (e.g., WAV, TIF, JFX, AU, GSM, etc.)

Table 2 File Type Table

CUSTOMER_KEY	Unique number identifying a customer in the database
FIRSTNAME	First name of customer
LASTNAME	Last name of customer
COMPANY	Company name of customer
ADDRESSLINE1	Company address
ADDRESSLINE2	Company address
CITY	Company city
MAILREGION	Company state or equivalent
MAILCODE	Zipcode or equivalent
COUNTRY	Company country
WORKNUMBER	Customer work phone number
HOMENUMBER	Customer home phone number
EMAILADDRESS	Email address of customer
COLLECTIONMETHOD	Collection method such as Credit card, Debit, etc.
BILLTYPE	e.g., Customer, Demo, free, corporate, etc.
STATUS	Status of customer, Active, Inactive, etc.
LANGUAGECODE	Language of customer, English, German, etc.
CURRENCYCODE	Currency for billing the customer, US Dollars, Pound Sterling, etc.

Table 3-Customer Table

FORMAT	Currency label
CURRENCY_SYMBOL	Symbol for currency

Table 4-Currency Table

CUSTOMERKEY	Unique number identifying a customer in the database
PAGERTYPECODE	Code to determine the kind of pager service
BBSNUMBER	Modem number for pager notification delivery, based on the pager type
PAGERNUMBER	Identifier number of the pager unit
PIN	PIN code for the pager unit
DISPLAYTYPE	Display type of the pager (numeric, alphanumeric, etc.)

Table 5-Notification Table

RESPONSE_ID	Unique ID for a response/receipt message to be sent to a customer
REPONSE_SUBJECT	Subject line of the response message
RESPONSE_FROM_EMAIL	From: line of the response message
RESPONSE_BODY	Actual text of the response message

Table 6-Response_email Table

RESOURCE_ID	Unique identifier for the resource
RESOURCE_TYPE	Type of resource (FAX, VOICE, etc.)
RESOURCE_STATUS	Status of resource (Active, Inactive, etc.).
RESOURCE_QUEUE_STATUS	Status of the Queue, number of messages in queue
RESOURCE_TIME_ZONE	Time zone for the resource
RESOURCE_QUEUE_MAX	Maximum size of the resource queue
RESOURCE_ADDRESS	Address of the resource (IP address, etc.)
RESOURCE_NAME	Name of the resource
RESOURCE_EXPIRY_DURATION	Expiry duration for any message sent to the specified resource
RESOURCE_QUEUE_IN_STATUS	Number of messages waiting to be delivered by the resource
RESOURCE_COMMUNICATION_TYPE	Method used to communicate with resource (HTTP, SHTTP, etc.)

Table 7-Resource Table

RESOURCE_ID	Unique identifier for the resource
RESOURCE_PREFIX	Any digits to be dialed before an actual number
RESOURCE_CITY_NAME	Name of destination city for the message to be delivered
RESOURCE_PROVIDER_RATE	Rate for a particular city (dollars per second, etc.)
RESOURCE_MAX_DIGITS	Max number of digits allowed to be dialed
RESOURCE_AREA_CODE	Area code for the particular city

Table 8-Resource Rates Table

Figures 4a and **4b** are a flow diagram of the processing performed by router/filter 23 using Tables 1-8. When a message is received it is placed into message queue 21 which is simply a storage area, the specifics of which, including the mechanism for placing the message into the queue are well known. Certain details concerning the message are also stored in a message queue table (Table 1). In step 41, router/filter, which is a computer program running on processing server 19, polls the message queue table for pending requests as determined by the existence of an

active message in the message status field. If no message is found, after a system defined delay, the message queue table is again polled (step 43). Once a message has been found in the table, processing continues with step 45 by determining the message type using the message_type field in Table 1 and the file type information in Table 2. The customer is then validated using information in Table 3 in step 47. In step 49, currency information for the customer is obtained from Table 4. The message is then filtered for possible pager notification using the information in Table 5 in step 51. In step 53, Table 7 is used to check for available resources to deliver the message. In step 55, the rates of available resources are checked to determine the least cost resource using Table 8. Then in step 59, the message is delivered using the determined least cost resource. After the message has been delivered, or after an error in the delivery has occurred, in step 59, a response/receipt is composed using Table 6. In step 61, the response or receipt is delivered to the sender. The system then begins the process over again at step 41.

As noted above outbound resource 31 is equivalent to communications server 150 as described in U.S. Application Serial No. 08/829,857. The modifications made to outbound resource to enable it to operate in a system having an architecture as described herein are as follows.

These changes will be described with reference to the message structure of received messages.

Message structure

Each field has a value following an '=' sign and is terminated by a newline character. The exception to this is the "Message" field where a newline immediately follows the '=" sign and the actual message follows on the next line.

The fields of a message are as follows:

Password=

MessageID=

MessageStatus=

MessageSentTimeStamp=

MessageDuration=

MessageLength=

MessageRemoteCSID=

MessageSourceCSID=

MessageAttachStatus=

MessageDestination=

ResourceID=

ResourceStatus=

ResourceLastCommTimeStamp=

ResourceExpiryDuration=

ResourceQueueInStatus=

ResourceQueueOutStatus=

ResourceChannelMax=

ResourceChannelStatus=

MessageBoundary=

Message=

In the following explanation of the above fields, the text in brackets at the end indicates the entity providing the value for the field in the forward/reverse direction (i.e., from router/filter 23 (RF) to outbound resource 31 (RESOURCE), and from RESOURCE to RF, respectively). "NA" indicates that no value is applicable, and the text "NA" is used to populate the field. "Same" indicates that the same value is used in the reverse direction, i.e, the RESOURCE does not modify the value; it only echoes the value it receives in that field.

Password - There is a fixed password pair for each RESOURCE and RF combination. RESOURCE stores the RF password in a flat text password file in a directory (jfaxom), and RF stores the RESOURCE password in the database. (RF/RESOURCE).

MessageID - Unique ID, per message, generated by RESOURCE. (RESOURCE/Same).

MessageStatus - Code indicating current status of the message. See Status codes below. (RF/RESOURCE)

MessageSentTimeStamp - Time stamp indicating date/time the message was delivered to the final destination by RESOURCE. (NA/RESOURCE)

MessageDuration - Time (in seconds) to transmit message from RESOURCE. (NA/RESOURCE)

Messagelength - Number of pages transmitted by RESOURCE. (NA/RESOURCE)

MessageRemoteCSID - called subscriber identification (CSID) of fax machine to which message was transmitted. (NA/RESOURCE)

MessageSourceCSID - Source CSID. This may be customized per customer. (RF/Same)

MessageAttachStatus - Value of "A" indicates a message is attached for delivery. (RF/RESOURCE)

MessageDestination - Destination phone number. (RF/Same)

ResourceID - Unique ID, per resource, stored in the database. (RF/Same)

ResourceStatus - Code indicating the current status of the resource, i.e., whether it is active or not. RF uses this to determine whether further messages should be sent to RESOURCE for delivery. See Status codes below. (NA/RESOURCE)

ResourceLastCommTimeStamp - Date/time of last communication between RF and RESOURCE. (RF/RESOURCE)

ResourceExpiryDuration - Life of message (in minutes) on RESOURCE. If a message has not been delivered to the final destination by RESOURCE within this amount of time, the message is considered "expired" and is discarded.

ResourceQueueInStatus - Number of messages waiting to be processed in an Inbox directory on RESOURCE. (NA/RESOURCE)

ResourceQueueOutStatus - Number of messages waiting to be processed in an Outbox directory on RESOURCE. (NA/RESOURCE)

ResourceChannelMax - Number of channels available for use on RESOURCE. (NA/RESOURCE)

ResourceChannelStatus - Channel activity status, e.g., 0000000111000001, where 0's indicate an idle channel and 1's indicate a busy channel. (NA/RESOURCE)

MessageBoundary - Text for MIME boundary. (RF/NA)

Message - Actual MIME message sent by RF. If MessageAttachStatus=NA, no message follows this tag.

All fields are NA if not used.

Date fields are expressed in MMDDYYhhmmss format.

Resource Status Codes are:

A - Active

I - Inactive

Message Status Codes are:

P - Pending

H - On Hold

D - Deferred

R - Ready for sending to RESOURCE

X - Exchanged, i.e., sent to RESOURCE but not acknowledged by it.

A - Sent to RESOURCE and acknowledged by it.

S - Sent (i.e., receipt for final delivery received from RESOURCE)

Normal sequence for Message delivery by RESOURCE is:

RF receives a request in its queue (message queue 21).

RF sends the message to RESOURCE.

RESOURCE gets message, authenticates password, and creates a new message in the Inbox directory.

RESOURCE acknowledges receipt of message.

RESOURCE processes the message in Inbox (MessageStatus=A, MessageAttachStatus=A).

RESOURCE moves message to a Process directory for further processing.

RESOURCE finishes processing message and delivers it to final destination.

RESOURCE removes the message from the Process directory.

RESOURCE creates a message in Outbox directory. (MessageStatus=S).

If a "reply message" is to be delivered to the original sender, MessageAttachStatus=A, else MessageAttachStatus=NA. MessageID remains the same in either case.

RESOURCE delivers receipt (with "reply message," if applicable) to RF.

RF receives the message and puts it in the Queue for database processing.

Processing server 19 with the above described functionality may be implemented using readily available systems such as a Windows NT server or a UNIX server. Database 27 may be implemented as a database server using readily available systems such as a Windows NT server or a UNIX server running, for example a SQL database.

While the present invention has been particularly described with reference to the various figures, it should be understood that the figures are for illustration only and should not be taken as limiting the scope of the invention. Many changes and modifications may be made to the invention, by one having ordinary skill in the art, without departing from the spirit and scope of the invention.

CLAIMS

We Claim:

1. A system for scalable architecture for the transfer of messages in one of a plurality of formats to a user in at least a second one of said plurality of formats comprising:

a) an internal data network for coupling to an external data network;

b) at least one first server coupled to the internal data network, said first server including a message queue and a router/filter;

c) at least one second server coupled to the internal data network and adapted to communicate with a third network type;

d) at least one database server coupled to the internal data network.

ABSTRACT OF THE INVENTION

A method and apparatus for accepting an incoming message over a packet network and transmitting it over a circuit switched network using a highly scalable architecture. The architecture utilizes a message queue and a router/filter within a private data network which is connected to an external data network such as the Internet, with separate outbound resource servers to provide the high degree of scalability, for handling a variety of message types.

APPENDIX I

Our Ref. No.: 002964.P001
Express Mail No.: EM020283632US

UNITED STATES LETTERS PATENT APPLICATION

FOR

METHOD AND APPARATUS FOR TRANSMISSION AND RETRIEVAL OF FACSIMILE AND AUDIO MESSAGES OVER A CIRCUIT OR PACKET SWITCHED NETWORK

Inventors: Jack Rieley
Jaye Muller

Prepared by:

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BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to the field of message receipt/transmission and delivery using computer networks. Specifically, the present invention relates to the subject of facsimile and voice transmission and retrieval over circuit/packet switched voice/data networks.

Description of Related Art

Voice and data communications systems such as the public switched telephone network (PSTN) are currently used to transfer image and text data transmitted by facsimile ("fax") machines in addition to the normally carried voice traffic. These faxed images are usually transmitted through the PSTN and received for printout or storage of the image on a destination fax machine or computer for the use by the recipient. Since the destination machine has typically been a fax, computer, printer or other such large capacity storage and output device, there has not been a need to compress the fax significantly for the destination output device. Furthermore, as the traditional destination has been either a full size print-out, computer monitor or mass storage media, no attempt has been made to facilitate the delivery of fax messages using other methods so as not to require the recipient to be physically close to the device which is coupled to the telephone line in order to receive the fax message.

For example, where user A has a fax machine connected to the PSTN using a telephone line with a number "XXX-YYY-ZZZZ" (where "XXX" represents the area code of the number, "YYY" the prefix of the number, and "ZZZZ" the remainder of the number), in order for user A to view a received fax message, user A must be physically located in the same area as the fax machine.

Similarly, audio messages are stored on fixed destination devices such as answering machines and "voice-mail" systems. To retrieve such audio messages, a recipient would either have to dial into the destination device or physically activate the play-back of audio messages through manipulation of the controls of an answering machine.

Thus, the ability to access both voice and fax messages from additional locations which would not require a user to either (1) be physically stationed near the receiving fax machine; or (2) to have to manually call a device to retrieve audio messages; would be desirable.

In addition, as a sender currently has to call or fax directly to the destination phone or fax machine, the sender incurs additional charges imposed by one or more telephone companies handling the call. Depending on the length of the fax or audio message, the telephone company charges can be substantial as calls are billed based on the time connected.

Hence, to be able to provide a sender with multiple phone numbers to which to send a message would be desirable, allowing the sender to choose the number which would closest, and, thus, the least expensive, to dial into.

SUMMARY OF THE INVENTION

To provide for the receipt and transmission of audio and fax information by a first user over a circuit switched network such as the PSTN to a second user over a packet switched network such as the Internet, a communications server is connected both to the circuit switched network and a packet switched network.

The communications server contains resources to receive and process incoming audio and facsimile calls from the circuit switched network into a format suitable for transmission over the packet switched network to the second user's address. In addition, a link is first determined between the second user's address on the circuit switched network and the second user's address on the packet switched network, and then an appropriate route to the second user's address on the packet network is determined. With the system being maintained in a distributed and redundant fashion, reliable receipt and transfer of all messages is ensured.

Thus, this electronic messaging system allows for the transfer of messages such as facsimile and audio messages from the circuit switched network to be collected and routed over the packet switched network.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a system diagram of a network configured pursuant to a preferred embodiment of the present invention containing a message server.

Figure 2 is a block diagram illustrating the message server configured in accordance with the preferred embodiment of the present invention.

Figure 3 is a flow diagram illustrating the operations of the preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a method and apparatus for allowing the receipt and transmission of audio and fax information between a circuit switched network and a packet switched network. For purposes of explanation, specific embodiments are set forth to provide a thorough understanding of the present invention. However, it will be understood by one skilled in the art, from reading this disclosure, that the invention may be practiced without these details. Further, although the present invention is described through the use of circuit switched and packet switched networks, most, if not all, aspects of the invention apply to all networks in general. Moreover, well-known elements, devices, process steps and the like are not set forth in detail in order to avoid obscuring the present invention.

Figure 1 contains a block diagram illustrating a system configured in accordance with a preferred embodiment of the present invention containing a communications server 150 connected to a circuit switched network 130 and a wide area network (WAN) 180. In the preferred embodiment, circuit switched network 130 is a circuit switched network such as the PSTN while WAN 180 is a packet switched network such as the Internet. It is to be noted that circuit switched network 130 can also be a network such as the generalized switched telephone network (GSTN), which encompasses PSTN networks, cellular telephone networks, and the other networks with which they are in communication.

Communications server 150 is connected to circuit switched network 130 via a switch 140 and to WAN 180 through the use of a router 185. As described in further detail below, in a preferred embodiment, switch 140 and router 185 are interfaced to communications server 150 using two separate hardware interfaces. In an alternate embodiment, switch 140 and router 185 can be interfaced to communications server 150 through the use of one hardware unit.

Connected to circuit switched network 130 is both a telephone unit 110 and a facsimile unit 120. Telephone unit 110 is a standard telephone capable of converting audio signals into electrical signals suitable for transmission over circuit switched network 130. Similarly, facsimile unit 120 is a standard facsimile machine capable of transmitting and receiving facsimile messages over circuit switched network 130. Each of these devices can be connected to circuit switched network 130 using either wired or wireless technology.

Connected to WAN 180 is a database server 195, a system management unit 197, a mail server 160, and a client 190. Each of these systems communicate with each other and with communications server 150 via WAN 180 using such protocols such as simple network management protocol (SNMP) and hyper-text transport protocol (HTTP)--packetized using a protocol such as the transmission control protocol/internet protocol (TCP/IP).

In the preferred embodiment, each one of database server 195, system management unit 197, mail server 160, and client 190, are stand-alone computers or workstations containing the hardware and

software resources to enable the operation of the present invention. In alternate embodiments, the functions provided by each one of database server 195, system management unit 197, mail server 160, and client 190, are provided by any number of computer systems.

In the preferred embodiment, mail server 160 is a server providing e-mail receipt and transmission using a protocol such as the simple mail transfer protocol (SMTP) and post office protocol (POP). Moreover, client 190 is configured to be able to communicate over WAN 180 using SMTP or POP in order to retrieve e-mail from mail server 160 or another suitably configured server.

System management unit 197 communicates with communications server 150 to monitor: (1) the processes on communications server 150; (2) the status of the trunk line connected to communications server 150; and (3) the connection between the various servers connected to WAN 180. As described below, if any processes on communications server 150 or connection to the circuit switched network 130 is interrupted, system management unit 197 can allocate resources, or cause the re-routing of a call or message via one or more redundant resources or connections, ensuring that the call or message is routed to the final destination.

Communications server 150 contains user data needed to receive and route incoming messages received from circuit switched network 130. The same information is also stored on database server 195. In the preferred embodiment, communications server 150 stores an inbound address, a set of final destination addresses; and an account status for each user. The inbound

address corresponds to the telephone number assigned to the user. As further discussed below, the inbound address is the number that a message sender dials on telephone unit 110 or facsimile unit 120 to leave a message for the user. The set of final destination address contain one or more e-mail addresses where the user account status information indicates whether the inbound address is either active and or inactive--i.e, whether the user is able to receive messages using the system.

Database server 195 stores a duplicate copy of the inbound address, the set of final destination addresses; and the account status for each user. Database server 195 also stores additional information for each user such as mailing address and billing information which are not used in the operation of the present invention but are note herein for completeness only. Thus, the information that is stored on communications server 150 is a subset of the information that is stored on database server 195, and if communications server 150 were to become inoperable or otherwise unable to handle incoming messages, database server 195 can configure another communications server to accept those calls.

In the preferred embodiment, system management unit 197 is responsible for monitoring the status of communications server 150 and re-assigning the users being handled by communications server 150 if communications server malfunctions or becomes overloaded with incoming calls. In the former case, system management unit 197 would re-assign all users being handled by communications server 150 to another communications server. In the latter case, system mananagment unit 197 would only off-load the only those

incoming calls for which communications server 150 does not have the available resources to process.

Figure 2 is a block diagram of communications server 150 configured in accordance with the preferred embodiment of the present invention, containing a processor 151 coupled to a memory subsystem 153 through the use of a system bus 155. Also coupled to system bus 155 is a network interface 156; a trunk interface 152; and a set of fax/voice processing resources 154. Set of fax/voice processing resources 154 and trunk interface 152 are also coupled to a bus 157.

Bus 157 is a bus that supports time division multiplex access (TDMA) protocols to optimize the flow of real time traffic between set of fax/voice processing resources 154 and trunk interface 152.

Memory subsystem 153 is used to store information and programs needed by communications server 150. The functioning of memory subsystems in computer design are well known to those of ordinary skill in the art and thus will not be further discussed herein.

In the preferred embodiment, trunk interface 152 is a trunk line interface, such as a T-1 or E-1 line, to switch 140 and can handle up to 24 channels of communications. Trunk line signaling is well known to those of ordinary skill in the art of telecommunication and thus will not be further discussed herein except as necessary for describing the invention.

Set of fax/voice processing resources 154 are made up of multiple fax/voice processing cards. Each of these processing cards contain processing units which are capable of receiving and

transmitting facsimiles according to established protocols, and which are capable of digitizing voice or other audio data, also according to established protocols. In the preferred embodiment, there are three fax/voice processing cards in set of fax/voice processing resources 154, each fax/voice processing card containing eight processing units capable of handling a channel from trunk interface 152. Thus, communications server 150 can communicate on twenty-four channels concurrently.

The storage of destination addresses on both circuit switched network 130 and WAN 180 is controlled by a database located either on communications server 150 or on database server 195. Keeping this information separate from communications server 150 allows communications server 150 to be a resource that can be allocated on demand. Hence, a number of communications servers could be used, along with one or more database servers, to allow a fully redundant and scalable system. In addition, system management unit 197 monitors the status and connection of all the communication and database servers.

Figure 3 is a flow diagram illustrating the operations of the preferred embodiment of the present invention when a call originating from a source on the circuit switched network 130. For example, either telephone unit 110 or facsimile unit 120 can initiate the call.

In block 400, an incoming call signal is received by communications server 150 from switch 140. The incoming call signal is initiated by telephone unit 110 or facsimile unit 120 over circuit switched network 130 and is routed to communications

server 150 via switch 140. Communications server 150 detects the incoming call signal using trunk interface 152. Operation would continue with block 402.

Continuing with block 402, trunk line interface unit 152, in addition to receives signals to indicate that there is an incoming call from switch 140, also receives signals indicating the circuit destination address of the incoming call. The destination address is captured by trunk interface 152 and is determined by trunk line signaling using mechanisms such as direct-inward-dial, or dual tone multifrequency (DTMF) tones.

Continuing with block 404, to determine whether or not to process the incoming call, processor 151 searches the list of inbound addresses contained in memory subsystem 153 for the destination address. If processor 151 finds the destination address in the inbound address list, processor 151 will then look up the account status for the user who owns the inbound address to determine if the account of that user is a valid user account. In an alternate embodiment, the validation is performed through the use of a database maintained by a separate entity such as database server 195. If the account is found to be inactive, communications server 151 will play a prepared message indicating that the number to which the incoming message was sent is an invalid account.

In block 406, once the validity of the user account has been established, processor 151 will attempt to allocate one fax/voice processing resource from set of fax/voice processing resources 154 and also determine the availability of other resources required

for the receipt and processing of the incoming call. These other resources include the processing capacity of processor 151, the storage capacity of memory subsystem 153.

If it is determined that the appropriate resources are not available, then the call will be routed to a different communications server that is capable of allocating the necessary resources. The routing of calls is accomplished by trunk line signaling via switch 140 and is managed by system management unit 197.

Also, it should be noted that the call will only come from switch 140 to communications server 150 if there are no problems with the line. Otherwise the call will get routed to a different communications server. In the preferred embodiment, fault detection and correction happens in one of two ways. First, on the telephone network side, switch 140 can be set up to independently route a call to another line if it is determined that one of the lines is bad. Second, if communications server 150 detect that the trunk line coming into trunk interface 152 is down, communications server 150 will notify system management unit 197 to reallocate the users for whom communications server 150 is responsible onto another communications server. Thus, system management unit 197 will transfer the duplicate user information contained in database server 195 into a different communications server.

In block 408, communications server 150 "answers" the incoming call by having trunk interface 152 go "off-hook" on the trunk line.

In block 410, if the fax/voice processing resource of set of fax/voice processing resources 154 which is processing the call determines that the incoming call is a fax transmission, then operation will continue with block 412. Otherwise, operation will continue with block 414. For example, if the call is a fax, a fax protocol is initiated, and the fax is received by one of the fax/voice processing resources of set of fax/voice processing resources 154. If the call is a voice call, the voice is recorded by one of the fax/voice processing resources of set of fax/voice processing resources 154.

In block 412, the fax/voice processing resource of set fax/voice processing resources 154 responsible for processing the incoming call will perform the fax transfer and store the incoming message as a temporary file in memory subsystem 153. In the preferred embodiment, the incoming fax is saved into a file which follows the group 3 facsimile file format. Operation will then continue with block 416.

In block 414, where it is determined that the incoming message is an audio message, the fax/voice processing resource of set of fax/voice processing resources 154 allocated to process the call will initiate an audio recording of the incoming voice message. In the preferred embodiment, the audio message is digitized and stored in memory subsystem 153 as a temporary file in a pulse code modulated format. After the incoming call has been digitized and stored, operation will then continue with block 416.

In block 416, trunk interface 152 will terminate the call. Operation will then continue with block 418.

In block 418, the incoming message, which has been stored as a temporary file in memory subsystem 153, is processed by processor 151. In the preferred embodiment, the temporary file is processed according to the type of the incoming call. If the incoming call was a fax transmission, then the temporary file, which has been stored as a group 3 facsimile file, will be converted into a file which follows the tagged image file format (TIFF), or a format that is suitable for transmission over WAN 180. Optionally, the temporary fax file can also be compressed at this stage. If the incoming call was an audio message, then the temporary file would be compressed using a compression scheme such as the scheme defined in the global system for mobile-communications (GSM) standard. In alternate operations, compressing and other processing of the incoming message is performed as the same time the incoming message is being received and being placed in memory subsystem 153.

In block 420, communications server 150 uses the inbound address to determine the set of final destination addresses, which are destinations on WAN 180 (i.e., the packet switched network), to send the processed incoming message. Communications server 150 then sends an electronic mail (e-mail) with the processed incoming message as an attachment to all the destinations in the set of final destination addreses.

For example, the e-mail containing the attachment is transferred to, and stored in, a server such as mail server 160,

The e-mail is then retrieved by client 190 whenever the user wishes. In an alternate embodiment, client 190 can retrieve the e-mail directly from communications server 150, without the storing operation of mail server 160.

While the present invention has been particularly described with reference to the various figures, it should be understood that the figures are for illustration only and should not be taken as limiting the scope of the invention. Many changes and modifications may be made to the invention, by one having ordinary skill in the art, without departing from the spirit and scope of the invention.

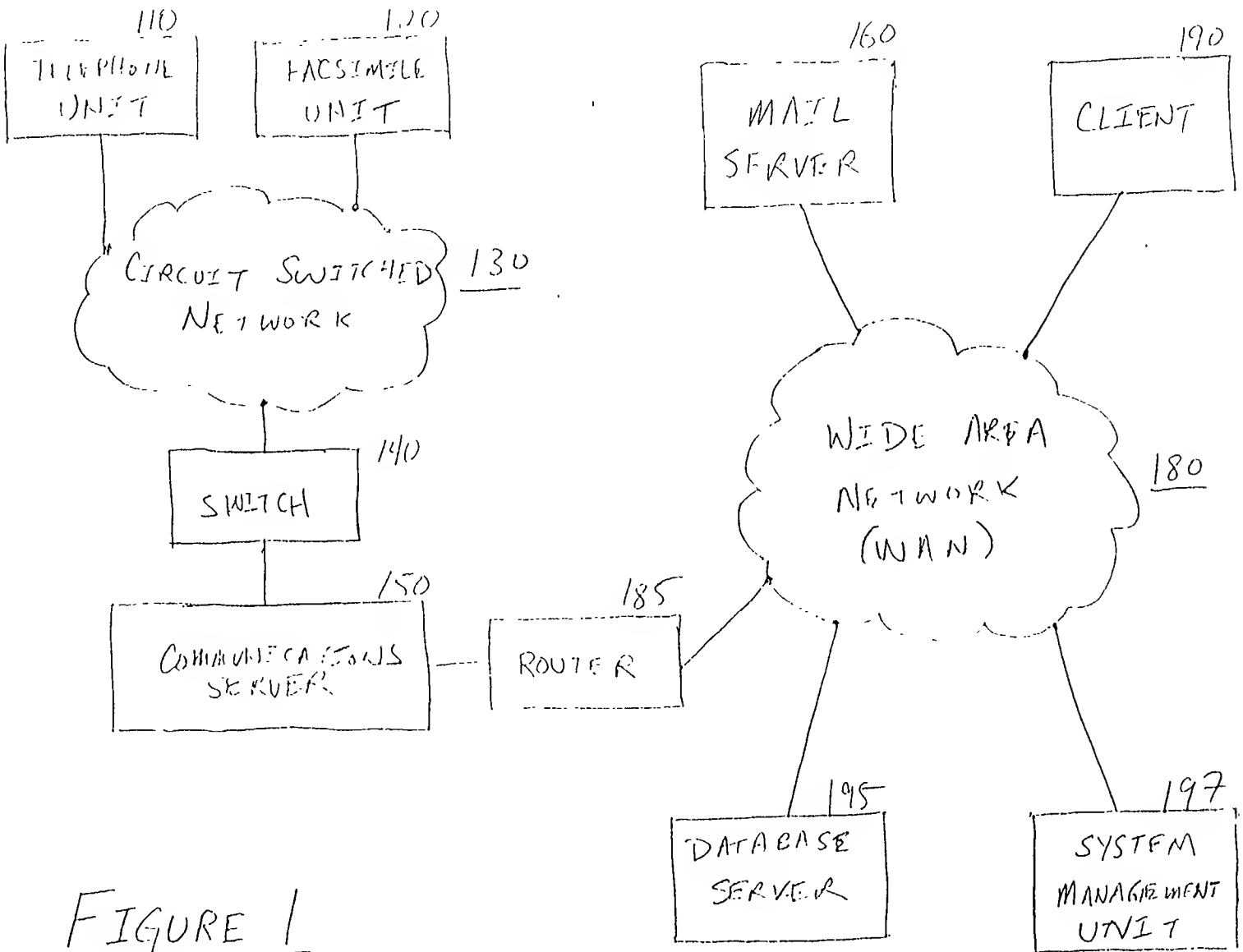

FIGURE 1

002964.P001

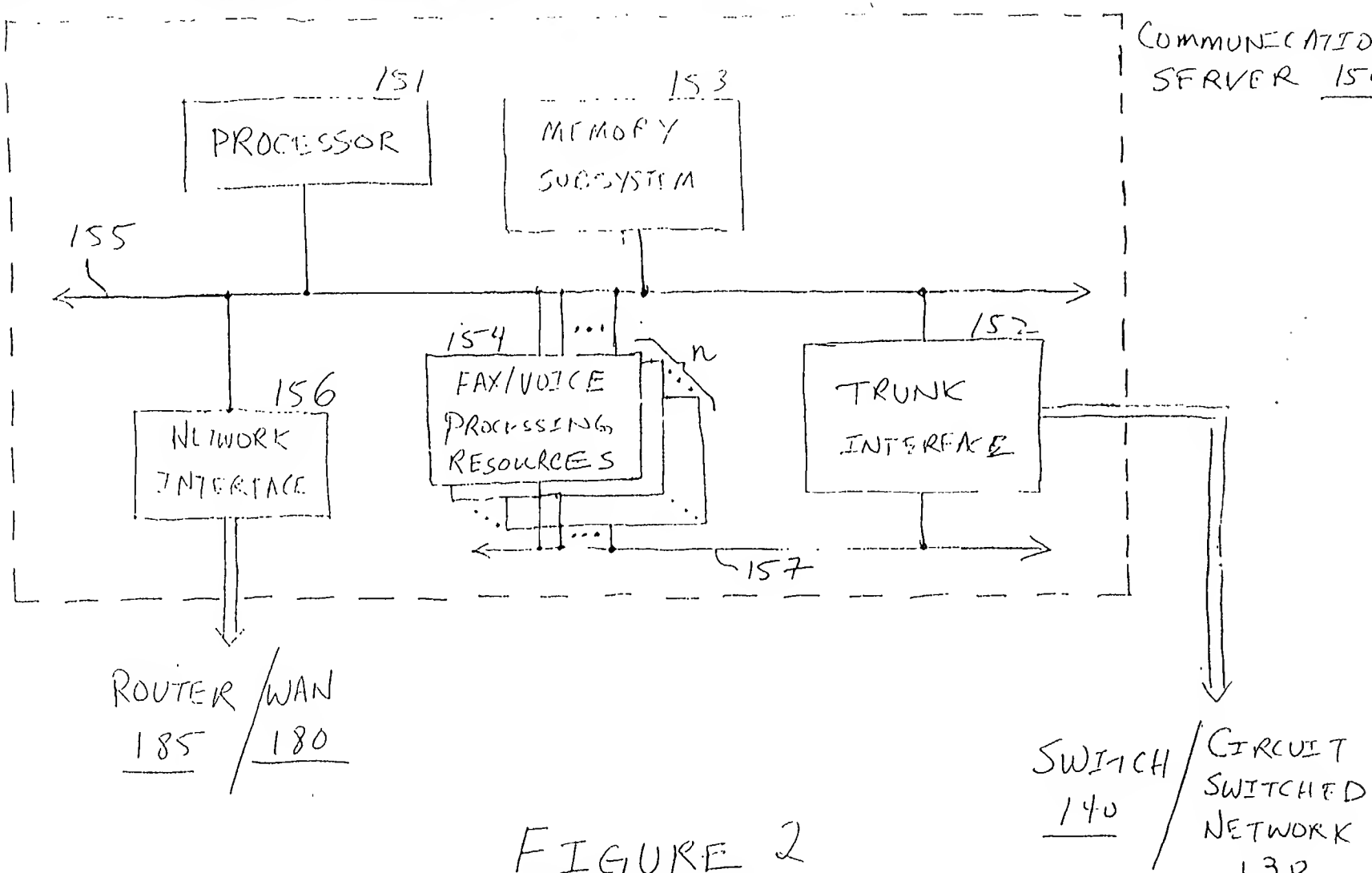
COMMUNICATIONS SERVER 150
151
PROCESSOR
153
MEMORY SUBSYSTEM
155
154
n
152
156
NETWORK INTERFACE
FAX/VOICE PROCESSING RESOURCES
TRUNK INTERFACE
157
ROUTER / WAN
185 / 180
SWITCH / CIRCUIT SWITCHED NETWORK
140 / 130

FIGURE 2

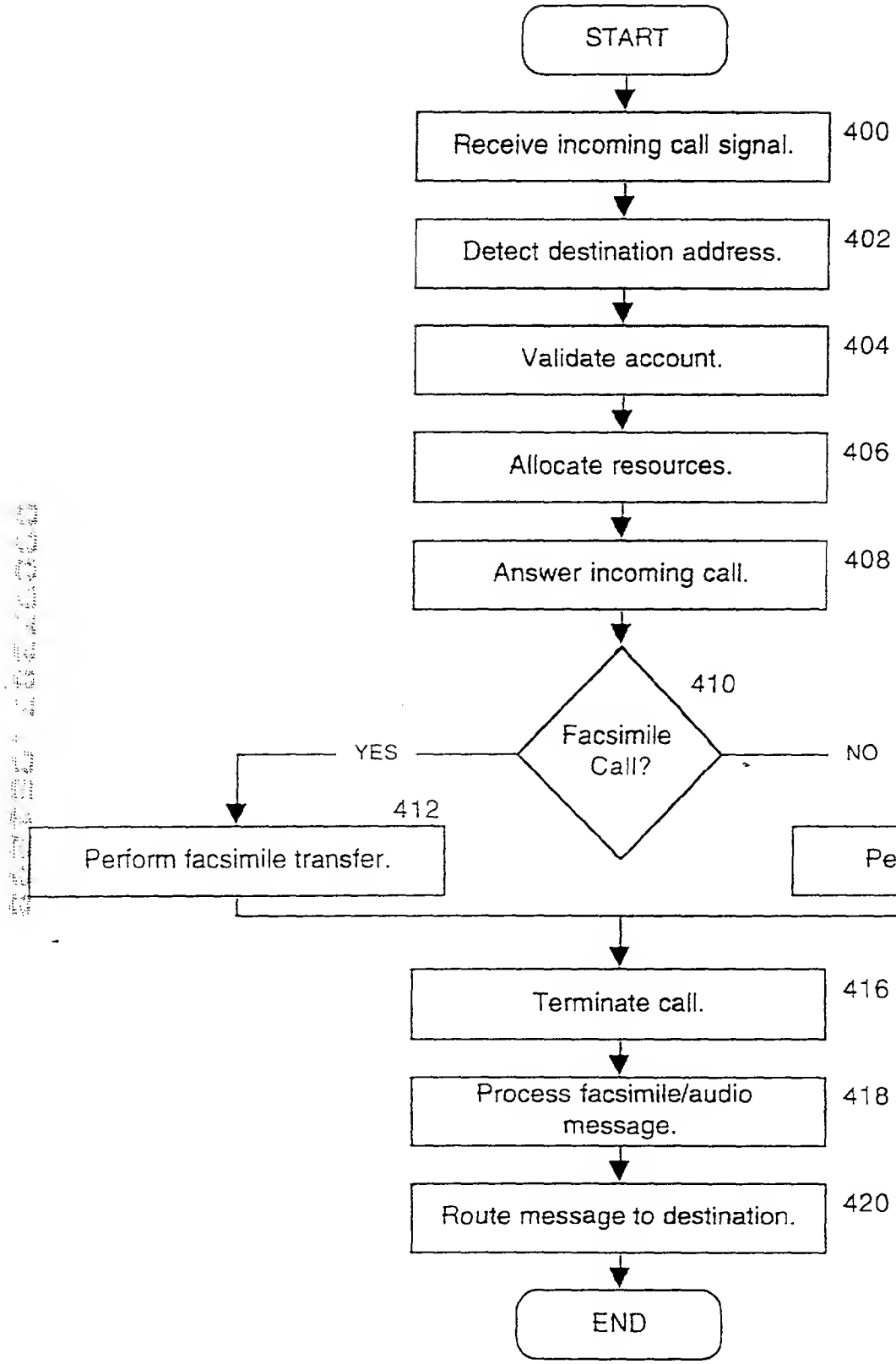
START
Receive incoming call signal.
400
Detect destination address.
402
Validate account.
404
Allocate resources.
406
Answer incoming call.
408
410
Facsimile Call?
YES
NO
412
Perform facsimile transfer.
414
Perform audio transfer.
Terminate call.
416
Process facsimile/audio message.
418
Route message to destination.
420
END

Figure 3

Attorney's Docket No.: 02964.P004

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or any original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

SCALABLE ARCHITECTURE FOR TRANSMISSION OF MESSAGES OVER A NETWORK

the specification of which ☒ is attached hereto.
☐ was filed on _____ as
United States Application Number _____
or PCT International Application Number _____
and was amended on _____ .
(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above. I do not know and do not believe that the claimed invention was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (for a utility patent application) or six months (for a design patent application) prior to this application.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d), of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

APPLICATION NUMBER	COUNTRY (OR INDICATE IF PCT)	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 37 USC 119
			☐ No ☐ Yes
			☐ No ☐ Yes
			☐ No ☐ Yes

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below:

APPLICATION NUMBER	FILING DATE

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION NUMBER	FILING DATE	STATUS (ISSUED, PENDING, ABANDONED)

I hereby appoint BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN, LLP, a firm including: Aloysius T. C. AuYeung, Reg. No. 35,432; William Thomas Babbitt, Reg. No. 39,591; Jordan Michael Becker, Reg. No. 39,602; Bradley J. Bereznak, Reg. No. 33,474; Michael A. Bernadicou, Reg. No. 35,934; Roger W. Blakely, Jr., Reg. No. 25,831; Gregory D. Caldwell, Reg. No. 39,926; Kent M. Chen, Reg. No. 39,630; Lawrence M. Cho, Reg. No. 39,942; Thomas M. Coester, Reg. No. 39,637; Roland B. Cortes, Reg. No. 39,152; William Donald Davis, Reg. No. 38,428; Michael Anthony DeSanctis, Reg. No. 39,957; Daniel M. De Vos, Reg. No. 37,813; Tarek N. Fahmi, Reg. No. 41,402; James Y. Go, Reg. No. 40,621; Sharmini Nathan Green, Reg. No. 41,410; David R. Halvorson, Reg. No. 33,395; Eric Ho, Reg. No. 39,711; George W Hoover II, Reg. No. 32,992; Eric S. Hyman, Reg. No. 30,139; Dag H. Johansen, Reg. No. 36,172; Stephen L. King, Reg. No 19,180; Michael J. Mallie, Reg. No. 36,591; Kimberley G. Nobles, Reg. No. 38,255; Ronald W. Reagin, Reg. No. 20,340; James H. Salter, Reg. No. 35,668; William W. Schaal, Reg. No. 39,018; James C. Scheller, Reg. No. 31,195; Charles E. Shemwell, Reg. No. 40,171; Maria McCormack Sobrino, Reg No. 31,639; Stanley W. Sokoloff, Reg. No. 25,128; Allan T. Sponseller, Reg. No. 38,318; Steven R. Sponseller, Reg. No. 39,384; Judith A. Szepesi, Reg. No. 39,393; Edwin H. Taylor, Reg. No. 25,129; George G. C. Tseng, Reg. No. 41,355; Lester J. Vincent, Reg. No. 31,460; John Patrick Ward, Reg. No. 40,216; Ben J. Yorks, Reg. No. 33,609; and Norman Zafman, Reg. No. 26,250; my attorneys; and Robert Andrew Diehl, Reg. No. 40,992; Thomas A. Hassing, Reg. No. 36,159; and Edwin A. Sloane, Reg. No. 34,728; my patent agents, with offices located at 12400 Wilshire Boulevard, 7th Floor, Los Angeles, California 90025, telephone (310) 207-3800, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Inventor's Signature _____ Date _____

Residence _____ (City, State) Citizenship _____ (Country)

P. O. Address _____

_____

Full Name of Fifth/Joint Inventor (given name, family name) _____

Inventor's Signature _____ Date _____

Residence _____ (City, State) Citizenship _____ (Country)

P. O. Address _____

_____

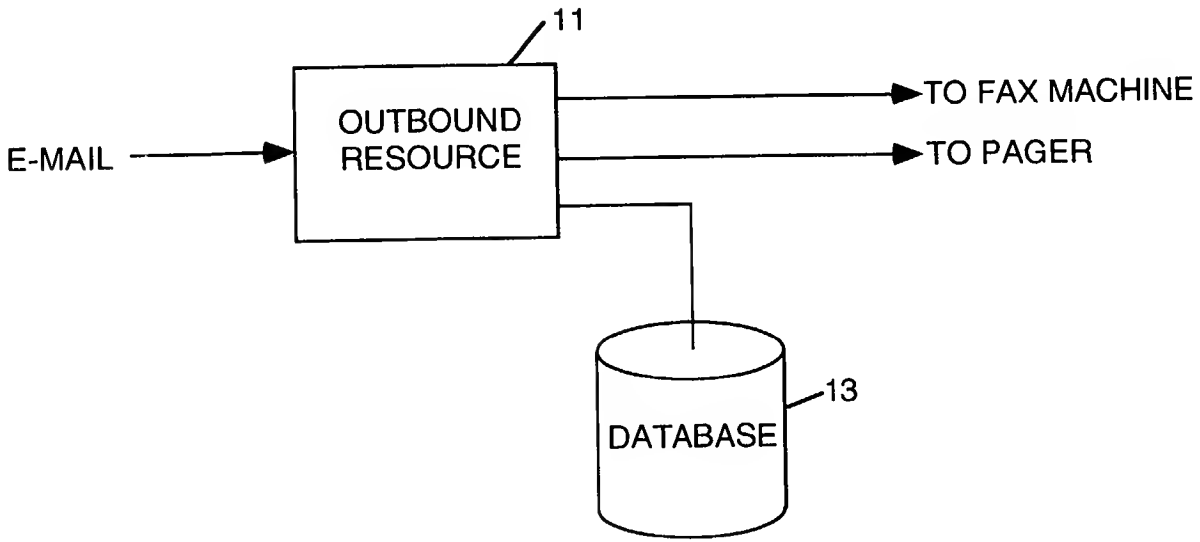

Fig. 1

PRIOR ART

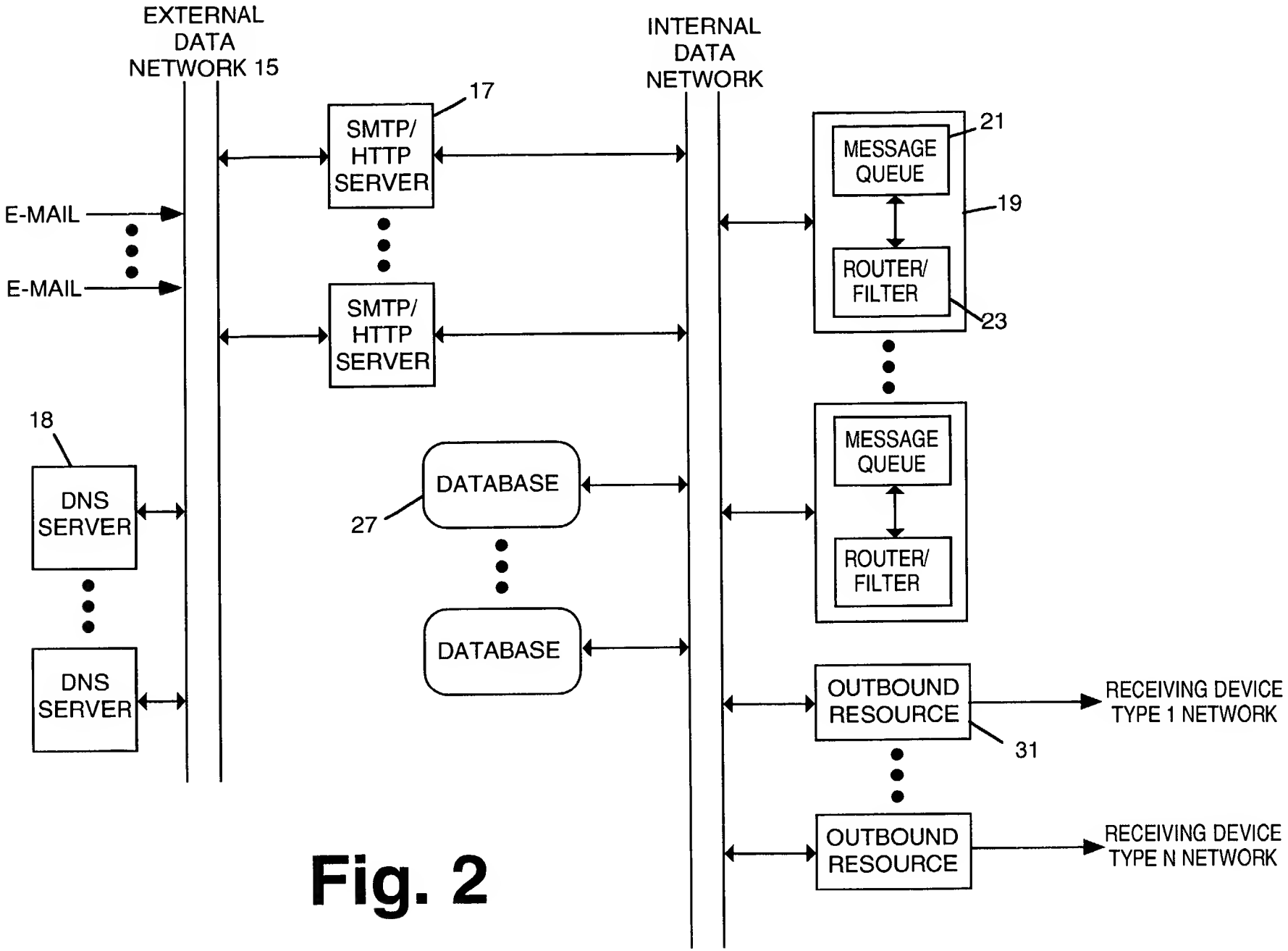
EXTERNAL DATA NETWORK 15
INTERNAL DATA NETWORK
17
SMTP/ HTTP SERVER
SMTP/ HTTP SERVER
E-MAIL
E-MAIL
18
DNS SERVER
DNS SERVER
DATABASE
27
DATABASE
21
MESSAGE QUEUE
19
ROUTER/ FILTER
23
MESSAGE QUEUE
ROUTER/ FILTER
OUTBOUND RESOURCE
31
RECEIVING DEVICE TYPE 1 NETWORK
OUTBOUND RESOURCE
RECEIVING DEVICE TYPE N NETWORK

Fig. 2

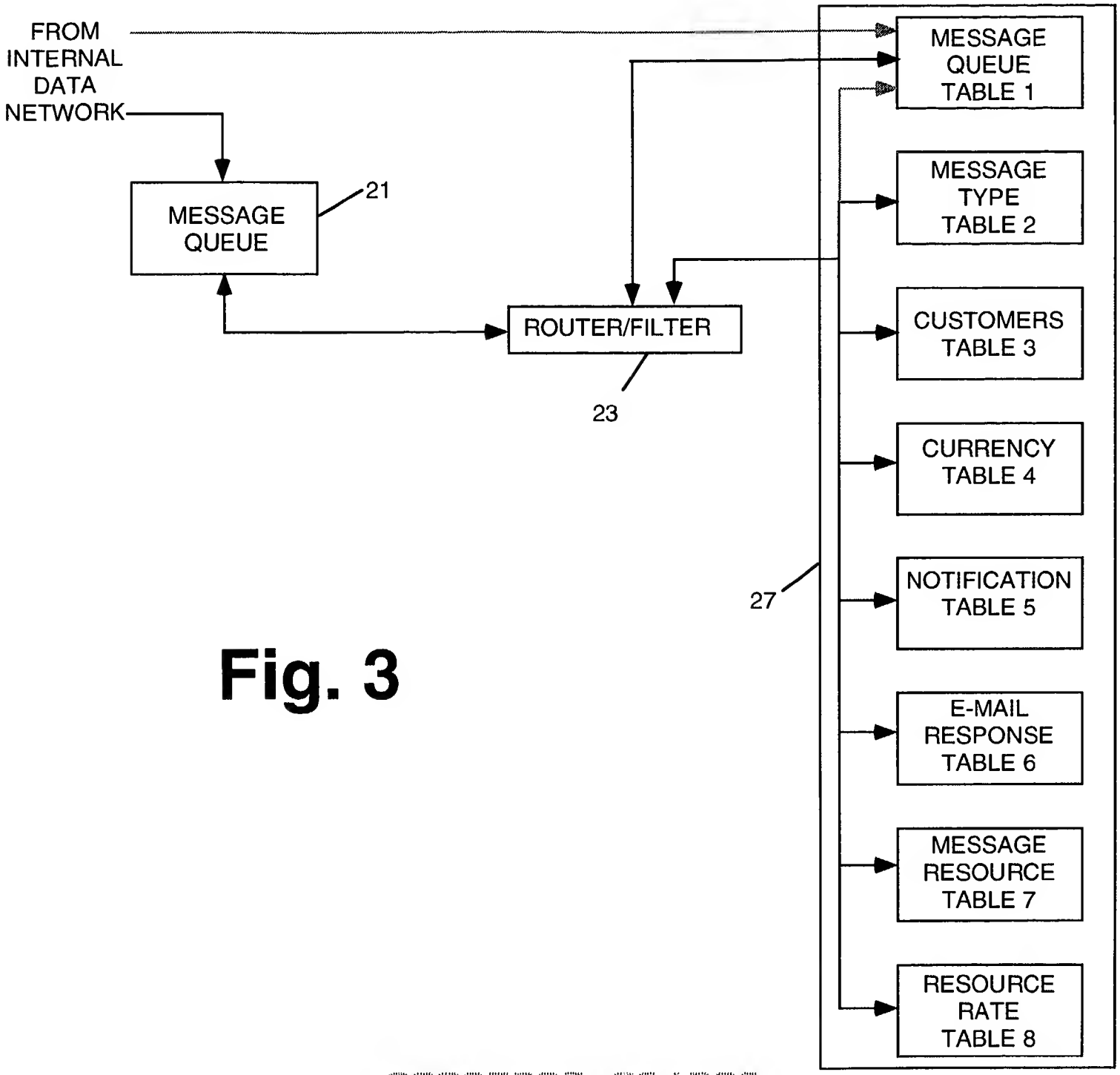
FROM INTERNAL DATA NETWORK
MESSAGE QUEUE
21
ROUTER/FILTER
23
27
MESSAGE QUEUE TABLE 1
MESSAGE TYPE TABLE 2
CUSTOMERS TABLE 3
CURRENCY TABLE 4
NOTIFICATION TABLE 5
E-MAIL RESPONSE TABLE 6
MESSAGE RESOURCE TABLE 7
RESOURCE RATE TABLE 8

Fig. 3

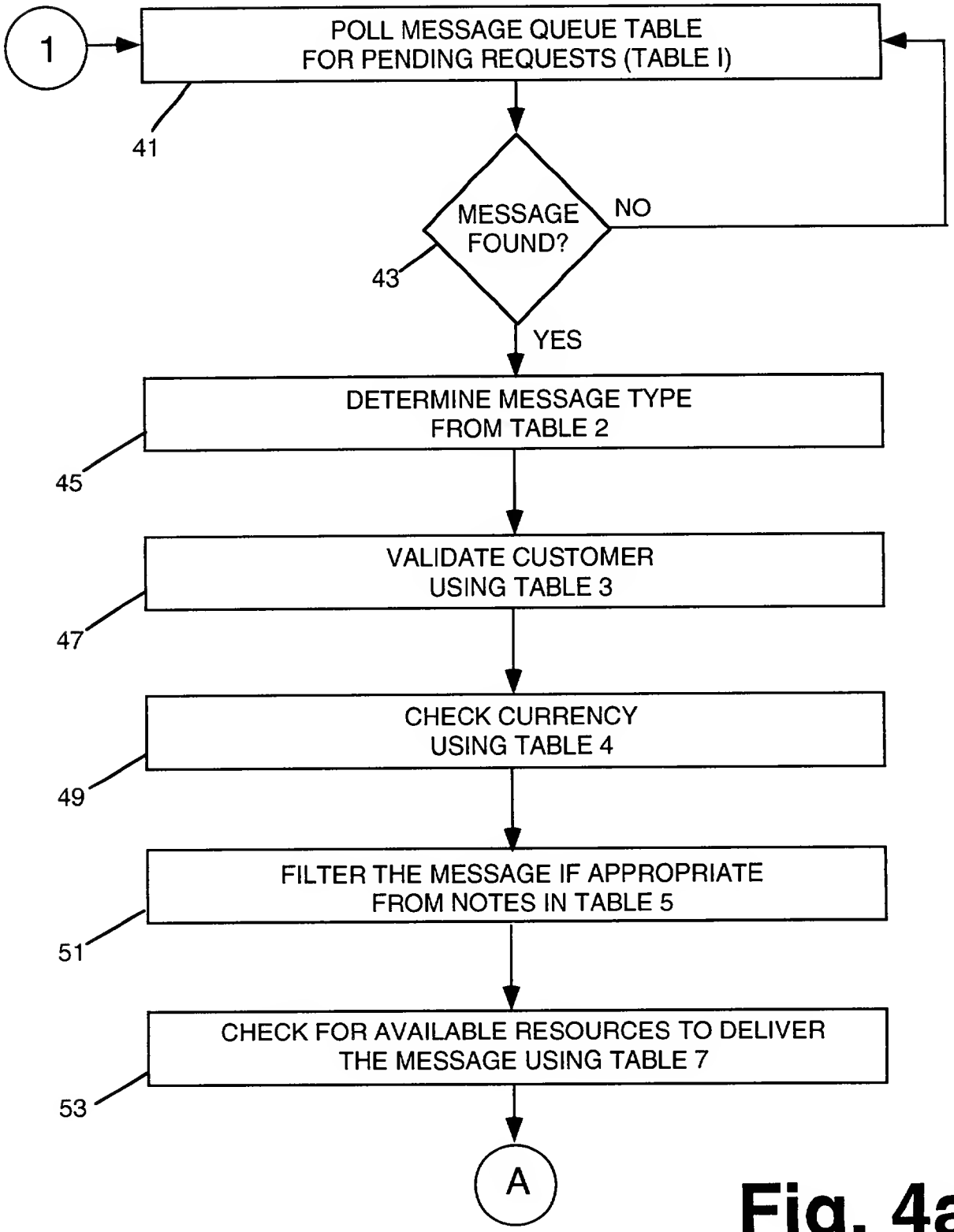
1
POLL MESSAGE QUEUE TABLE
FOR PENDING REQUESTS (TABLE I)
41
MESSAGE
FOUND?
NO
43
YES
DETERMINE MESSAGE TYPE
FROM TABLE 2
45
VALIDATE CUSTOMER
USING TABLE 3
47
CHECK CURRENCY
USING TABLE 4
49
FILTER THE MESSAGE IF APPROPRIATE
FROM NOTES IN TABLE 5
51
CHECK FOR AVAILABLE RESOURCES TO DELIVER
THE MESSAGE USING TABLE 7
53
A

Fig. 4a

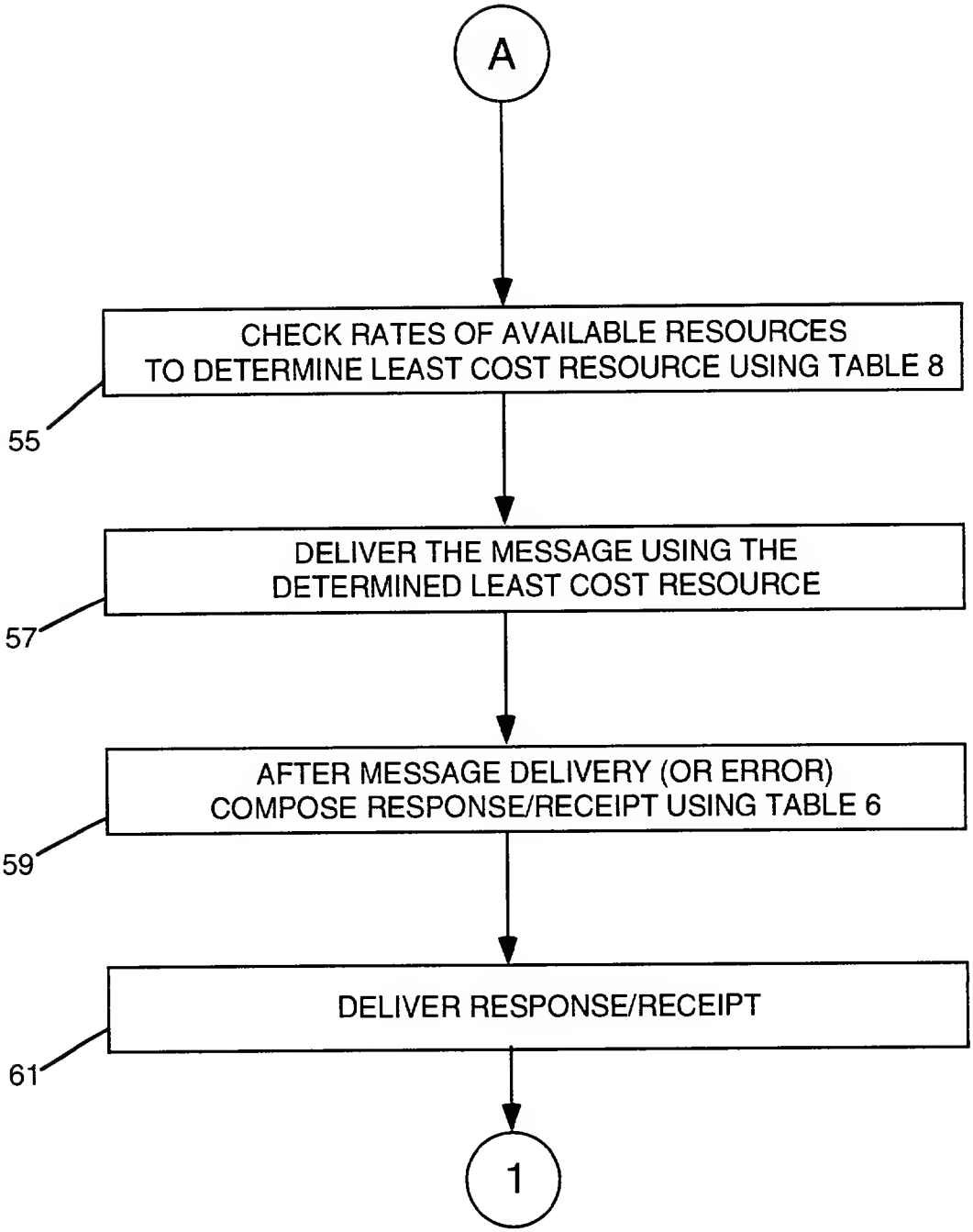
A
CHECK RATES OF AVAILABLE RESOURCES TO DETERMINE LEAST COST RESOURCE USING TABLE 8
55
DELIVER THE MESSAGE USING THE DETERMINED LEAST COST RESOURCE
57
AFTER MESSAGE DELIVERY (OR ERROR) COMPOSE RESPONSE/RECEIPT USING TABLE 6
59
DELIVER RESPONSE/RECEIPT
61
1

Fig. 4b